

IN THE CLAIMS

- 1 1. (currently amended) An apparatus for determining a property of a fluid
2 downhole comprising:
3 a resonator associated with the fluid downhole;
4 a controller ~~for actuating~~ which actuates the resonator;
5 ~~a monitor for receiving a response from the resonator to the actuation of the~~
6 ~~resonator such that the response is associated with the fluid; and~~
7 a processor ~~for estimating~~ which estimates the property for the fluid downhole
8 using a response of the resonator to the actuation.
9
- 1 2. (previously presented)The apparatus of claim 1, wherein the processor uses a
2 chemometric equation for estimating the property.
3
- 1 3. canceled
2
- 1 4. (previously presented)The apparatus of claim 1 wherein the processor uses a
2 function for deriving a chemometric equation from measured resonator response.
3 correlated with known fluid property values.
4
- 1 5. (previously presented)The apparatus of claim 1, wherein the property is viscosity.
2
- 1 6. (previously presented)The apparatus of claim 1, wherein the property is density.

2

1 7. (previously presented)The apparatus of claim 1, wherein the property is dielectric
2 constant.

3

1 8. (previously presented)The apparatus of claim 1, wherein the property is
2 resistivity.

3

1 9. (previously presented)The apparatus of claim 2, wherein the processor applies
2 the chemometric estimated property to a Levenberg-Marquardt (LM) algorithm to
3 determine a fluid parameter value for the fluid.

4

1 10. (original) The downhole tool of claim 10, wherein the fluid parameter value
2 comprises a global minimum for the LM algorithm.

3

1 11. (currently amended) A method for determining a property of a fluid downhole
2 comprising:

3 interacting with a downhole fluid with a resonator

4 actuating the resonator;

5 receiving a response from the resonator to the actuation of the resonator; and

6 estimating a value of the property of the fluid downhole based on the resonator

7 response.

8

1 12. (previously presented)The method of claim 11, further comprising:

2 estimating the fluid property using a chemometric equation.

3

4

1 13. canceled

2

1 14. (original) The method of claim 11, further comprising:

2 deriving a chemometric equation from measured resonator response correlated
3 with known fluid property values.

4

1 15. (previously presented)The method of claim 11, wherein the property is viscosity.

2

1 16. (previously presented)The method of claim 11, wherein the property is density.

2

1 17. (previously presented)The method of claim 11, wherein the property is dielectric
2 constant.

3

1 18. (previously presented)The method of claim 11, wherein the property is resistivity

2

1 19. (previously presented)The method of claim 12, further comprising:

2 applying the chemometric estimated parameter value to a Levenberg-Marquardt
3 (LM) algorithm to determine a fluid parameter value for the fluid.

4

1 20. (previously presented)The method of claim 19, wherein the fluid parameter value
2 comprises a global minimum for the LM algorithm.

3
1 21-30 (cancelled)

2
1 31. (currently amended) A system for determining the properties of a fluid
2 comprising:
3 a surface controller which lowers a tool deployed in a well bore formed in an
4 adjacent formation, the tool interacting with a down hole fluid;
5 a resonator associated with the down whole fluid;
6 a controller for actuating the resonator;
7 ~~a monitor for receiving a response from the resonator to the actuation of the~~
8 ~~resonator such that the response is associated with the fluid; and~~
9 a processor ~~for estimating~~ which estimates a value of a property for the down
10 ~~whole-hole~~ fluid fluid.

11
1 32. (currently amended) The system of claim + 31, ~~further comprising:~~
2 wherein the processor uses a chemometric equation for estimating a fluid
3 the property value.
4
5

1 33. (currently amended) The system of claim ~~12~~ 32, ~~further comprising~~: wherein the
2 processor applies a function applying the resonator response to a the
3 chemometric equation to determine a the fluid property value.
4

1 34. (currently amended) The system of claim ~~1~~ 31, ~~further comprising~~:
2 wherein the processor uses a function for deriving a chemometric equation
3 from measured resonator response correlated with known fluid property
4 values.
5

1 35. (currently amended) The system of claim ~~1~~ 31, wherein the parameter
2 value property is viscosity.
3

1 36. (currently amended) The system of claim ~~1~~ 31, wherein the parameter value
2 property is density.
3

1 37. (currently amended) The system of claim ~~1~~ 31, wherein the parameter value
2 property is dielectric constant.
3

1 38. (currently amended) The system ~~apparatus~~ of claim ~~1~~ 31, wherein the parameter
2 value property is resistivity.
3

1 39. (currently amended) The system of claim 12, ~~further comprising~~:

2 wherein the processor ~~applying~~ applies the chemometric estimated
3 parameter value property to a Levenberg-Marquardt (LM) algorithm to
4 determine a fluid parameter value for the fluid.
5

1 40. (currently amended) The system of claim ~~10~~ 39, wherein the fluid parameter
2 value comprises a global minimum for the LM algorithm.
3

1 41. (new) The apparatus of claim 1 wherein the resonator comprises a mechanical
2 resonator.
3

1 42. (new) The apparatus of claim 1 wherein the resonator comprises a tuning fork.